

IN THE CLAIMS

Please amend the claims as follows:

Claims 1-4 (canceled)

Claim 5 (currently amended): A forging method for upsetting a diameter expansion scheduled portion of a bar-shaped raw material using a swaging an upsetting apparatus equipped with a fixing die for fixing [[a]] the bar-shaped raw material, a guide having an insertion passage for inserting and holding the raw material in a buckling preventing state, and a punch for axially pressing the raw material inserted in and held by the insertion passage of the guide in an axial direction of the raw material,

the forging method comprising:

wherein inserting a scheduled enlarged diameter portion the diameter expansion scheduled portion of the raw material fixed to the fixing die with the scheduled enlarged diameter portion diameter expansion scheduled portion protruded from the fixing die is inserted into the insertion passage of the guide[[,]]; and thereafter,

moving the guide in a direction opposite to a moving direction of the punch while axially pressing the raw material with the punch by moving the punch[[,]] in a state in which a part of a peripheral surface of an exposed portion of the raw material exposed between the guide and the fixing die is restrained or an entire peripheral surface of the exposed portion of the raw material is not restrained, to thereby execute upsetting of the scheduled enlarged diameter portion diameter expansion scheduled portion of the raw material is subjected to swaging processing by moving the guide in a direction opposite to a moving direction of the punch,

wherein the upsetting is executed so that, in the case of $t_0 < T$, G satisfies a relational expression of:

$$(L-X)/[(l_0-L)/P-t_0] \leq G \leq P(X_1-X)/(l_0-X_1-Pt_0),$$

where ["P"] P is an average moving speed of the punch from [[an]] initiation of a movement thereof[[;]], ["G"] G is an average moving speed of the guide from [[an]] initiation of the movement thereof[[;]], ["X₀"] X₀ is a buckling limit length at the cross-sectional area of the raw material before the swaging processing upsetting,[[;]] ["X₁"] X₁ is a buckling limit length at the cross-sectional area of [[the]] an enlarged diameter portion of the raw material after the swaging processing upsetting,[[;]] ["X"] X is an initial clearance between the guide and the fixing die ($0 \leq X \leq X_0$)[[;]], ["t₀"] t₀ is a time lag from the initiation of the movement of the punch to the initiation of the movement of the guide ($0 \leq t_0$)[[;]], ["L"] L is a length of the enlarged diameter portion of the raw material after the swaging processing upsetting,[[;]] ["l₀"] l₀ is a length of the raw material in the state prior to the swaging processing upsetting required for the enlarged diameter portion[[;]], and ["T"] T is a swaging processing upsetting time from the initiation of the movement of the punch, if $t_0 < T$, "G" satisfies the following relational expression: $(LX)/(l_0 - L)/P \cdot t_0 \leq G \leq P(X_1 - X)/(l_0 - X_1 - Pt_0)$.

Claim 6 (currently amended): The forging method as recited in claim 5, wherein the scheduled enlarged diameter portion diameter expansion scheduled portion of the raw material is an end portion of the raw material.

Claim 7 (currently amended): The forging method as recited in claim 5, wherein the scheduled enlarged diameter portion diameter expansion scheduled portion of the raw material is an axial central portion of the raw material.

Claim 8 (currently amended): The forging method as recited in claim 5, wherein the scheduled enlarged diameter portion diameter expansion scheduled portion of the raw material is one end portion of the raw material and the other end portion thereof, wherein each of the one end portion and the other end portion of the raw material fixed to the fixing die with the one end portion and the other end portion protruded from the fixing die is [[are]] inserted into the insertion passage of the corresponding guide, and wherein the one end

portion and the other end portion are simultaneously subjected to ~~swaging processing upsetting~~.

Claim 9 (currently amended): The forging method as recited in claim [[1]] 5, wherein an edge portion of a leading end surface of the guide at a side of the insertion passage and/or an opening edge portion of a raw material fixing and fitting aperture formed in the fixing die are beveled.

Claim 10 (currently amended): The forging method as recited in claim [[1]] 5, wherein the ~~scheduled enlarged diameter portion~~ diameter expansion scheduled portion of the raw material is subjected to ~~swaging processing upsetting~~ with a part of a peripheral surface of the raw material restrained by a restraining die portion having a forming dented portion, and thereafter the enlarged diameter portion of the raw material is pressed with a second punch provided at the restraining die portion to thereby fill the forming dented portion with the material of the enlarged diameter portion by plastically deforming the enlarged diameter portion within the forming dented portion of the restraining die portion.

Claim 11 (original): The forging method as recited in claim 10, wherein the fixing die is provided with a flash forming dented portion continuing from the forming dented portion of the restraining die portion, and wherein the material of the enlarged diameter portion is filled into the forming dented portion and the flash forming dented portion by plastically deforming the enlarged diameter portion within the forming dented portion of the restraining die portion.

Claim 12 (original): The forging method as recited in claim 10, wherein the forming dented portion is a closed dented portion.

Claim 13 (canceled)

Claim 14 (currently amended): A forging apparatus[[,]] comprising: a ~~swaging~~ apparatus,

an upsetting apparatus comprising wherein the swaging apparatus includes: a fixing die for fixing a bar-shaped raw material[[;]], a guide having an insertion passage for inserting and holding the raw material in a buckling preventing state[[;]], a punch for axially pressing the raw material inserted in and held by the insertion passage of the guide ~~in an axial direction of the raw material;~~, and a guide driving device for moving the guide in a direction opposite to a moving direction of the punch so that a length of the exposed portion of the raw material exposed between the guide and the fixing die becomes equal to or less than a buckling limit length ~~or less~~ at a cross-sectional area of the exposed portion of the raw material,

wherein the guide driving device is configured to move the guide so that, if $t_0 < T$, G satisfies a relational expression of:

$$(L-X)/[(l_0-L)/P-t_0] \leq G \leq P(X_1-X)/(l_0-X_1-Pt_0),$$

where P is an average moving speed of the punch from initiation of a movement thereof, G is an average moving speed of the guide from initiation of the movement thereof, X_0 is a buckling limit length at the cross-sectional area of the raw material before the upsetting, X_1 is a buckling limit length at the cross-sectional area of an enlarged diameter portion of the raw material after the upsetting, X is an initial clearance between the guide and the fixing die ($0 \leq X \leq X_0$), t_0 is a time lag from the initiation of the movement of the punch to the initiation of the movement of the guide ($0 \leq t_0$), L is a length of the enlarged diameter portion of the raw material after the upsetting, l_0 is a length of the raw material in the state prior to the upsetting required for the enlarged diameter portion, and T is an upsetting time from the initiation of the movement of the punch.

Claim 15 (currently amended): The forging apparatus as recited in claim 14, wherein the swaging upsetting apparatus performs swaging processing upsetting in a state in which a

part of a peripheral surface of the exposed portion of the raw material is restrained or an entire peripheral surface of the exposed portion of the raw material is not restrained.

Claim 16 (currently amended): The forging apparatus as recited in claim 14, wherein the swaging upsetting apparatus further includes a restraining die portion for restraining a part of the peripheral surface of the exposed portion of the raw material.

Claim 17 (currently amended): The forging apparatus as recited in claim 16, wherein the restraining die portion is provided with a second punch for pressing the enlarged diameter portion of the raw material formed by the swaging upsetting apparatus and a forming dented portion into which the material of the enlarged diameter portion is filled by the pressing of the enlarged diameter portion by the second punch.

Claim 18 (original): The forging apparatus as recited in claim 17, wherein the fixing die is provided with a flash forming dented portion continuing from the forming dented portion of the restraining die portion.

Claim 19 (original): The forging apparatus as recited in claim 17, wherein the forming dented portion is a closed dented portion.